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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/685,983

**Applicant(s)**

ZAKHAROV ET AL.

**Examiner**

Chat C. Do

**Art Unit**

2193

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 November 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-9, 11, 13-44, 47, 49-73 and 75-80 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are rejected.
- 7) ☒ Claim(s) 1-9, 11, 13-44, 47, 49-73 and 75-80 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

1. This communication is responsive to Amendment filed 11/04/2008
2. Claims 1-9, 11, 13-44, 47, 49-73 and 75-80 are pending in this application. Claims 1, 37-39, 72-73, 75 and 80 are independent claims. In Amendment, claims 10, 12, 45-46, 48, 74 and 81-122 are cancelled. This Office Action is made final.

***Claim Rejections - 35 USC § 101***

3. 35 U.S.C. 101 reads as follows:  
  
Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.
4. Claims 1-9, 11, 13-44, 47, 49-73 and 75-80 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-9, 11, 13-44, 47, 49-73 and 75-80 cite a method, medium and apparatus for solving a system of N linear equations in accordance with a mathematical algorithm. However, claims 1-9, 11, 13-44, 47, 49-73 and 75-80 merely disclose mental steps/components for solving a system of N linear equations without disclosing a practical/physical application as tangible result. Even though, the claims mention about the application in which it is necessary to solve the system of linear equation, however this application is mathematical application. In addition, the method claims 1-9, 11, 13-36, 39-44, 47 and 49-71 fail to explicitly tie to another statutory class as specific hardware for realizing the implementation. Even though, the claims are directing to a computer for executing the method, however the computer is not specialized hardware.

The medium claims 38 and 73 are logically and reasonable interpreted as a non-tangible medium since the program memory for carrying the computer readable program code instead of storing the computer readable program code. Finally, other claims are apparatus claims but merely disclose general computer components without specific hardware components for carrying the claimed invention. Therefore, claims 1-9, 11, 13-44, 47, 49-73 and 75-80 are directed to non-statutory subject matter.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-9, 11, 13-44, 47, 49-73 and 75-80 are rejected under 35 U.S.C. 102(XYZ) as being anticipated by XUZ.

7. Claims 1-9, 11, 13-25, 30-44, 47, 49-61, 66-73 and 75-80 are rejected under 35 U.S.C. 102(b) as being anticipated by Simon ("An Overlaying Technique for Solving Linear Equations in Real-Time Computing").

Re claim 1, Simon discloses in Figure 1 a computer implemented method for solving a system of N linear equations in N unknown variables (e.g. abstract and expression 2 in page 513), the method comprising: receiving a plurality of input signals; processing the received input signals to form the system of linear equations (e.g. having input of values in expression 1 in page 513) (a) storing an estimate value for each

unknown variable in a processor (e.g.  $x_{\text{initial}}$  in Figure 1 and "Acceleration of the Computational Procedures" section in page 516); (b) initializing, in the processor, each estimate value to a predetermined value (e.g.  $x_{\text{initial}}$  in Figure 1), and establishing, in the processor, a respective auxiliary value for each estimate value (e.g. paragraph right under expression 9 in page 515 and "Finding a Solution for a Set of Linear Equations" section in page 515); (c) for each estimate value (e.g. for looping as seen in Figure 1 and "Preparing for the Next Cycle" section in page 516): (i) determining, in the processor, whether a respective predetermined condition is satisfied, the predetermined condition involving the respective auxiliary value (e.g. Figure 1 and "Preparing for the Next Cycle" section in page 516 as it meets the condition for moving to the next loop/cycle of computation); and (ii) updating, the processor, the estimate if and only if the respective predetermined condition is satisfied (e.g. as not meet within threshold/condition in Figure 1); and (d) repeating step (c) a plurality of times (e.g. Figure 1 and "Preparing for the Next Cycle" section in page 516); and outputting the estimate values from the processor to provide an estimate of a solution to said system of linear equations for an application in which it is necessary to solve said system of linear equations (e.g. abstract and "Introduction" section in page 513).

Re claim 2, Simon further discloses in Figure 1 updating comprises adding a scalar value  $d$  to the respective estimate value, or subtracting a scalar value  $d$  from the respective estimate value (e.g. expressions 17-22 in page 515 ).

Re claim 3, Simon further discloses in Figure 1 scalar value  $d$  is updated in a predetermined manner (e.g. "Transformation to Residuals" section in page 515).

Re claim 4, Simon further discloses in Figure 1 scalar value  $d$  is updated when and only when step (c) updates no estimate values (e.g. Figure 1).

Re claim 5, Simon further discloses in Figure 1 updating divides  $d$  by a scalar update value (e.g. expressions 11-16 in page 515).

Re claim 6, Simon further discloses in Figure 1 the scalar update value is equal to a power of two (e.g. binary value in expressions 11-16 in page 515).

Re claim 7, Simon further discloses in Figure 1 the scalar update value is equal to two (e.g. as power to one in binary value in expressions 11-16 in page 515).

Re claim 8, Simon further discloses in Figure 1 each of estimate values is initialised to be equal to zero (e.g.  $x_{\text{initial}}$  in Figure 1).

Re claim 9, Simon further discloses in Figure 1 the respective predetermined condition for each respective estimate value does not involve the respective estimate value (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516).

Re claim 11, Simon further discloses in Figure 1 auxiliary values form an auxiliary vector  $Q$  (e.g. expressions 11-22 in page 515).

Re claim 13, Simon further discloses in Figure 1 a plurality of auxiliary values are associated with each estimate value (e.g. expressions 10-22 in page 515).

Re claim 14, Simon further discloses in Figure 1 the predetermined condition for a respective estimate value involves the maximum amongst the plurality auxiliary values (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516).

Re claim 15, Simon further discloses in Figure 1 the minimum value is compared with a threshold value (e.g. as comparing with as seen in Figure 1 and "Preparing for the Next Cycle" section in page 516).

Re claim 16, Simon further discloses in Figure 1 the condition is satisfied if the minimum value is less than the threshold value ("Preparing for the Next Cycle" section in page 516 and Figure 1).

Re claim 17, Simon further discloses in Figure 1 the plurality of auxiliary values for a respective estimate value consist of a first auxiliary value, and second auxiliary value which is the negative of the first auxiliary value (e.g. lower and upper bound by computing the norm in Figure 1 and "Preparing for the Next Cycle" section in page 516).

Re claim 18, Simon further discloses in Figure 1 the threshold value for the  $n$ th unknown variable is the scale value  $d$  multiplied by the coefficient of the  $n$ th unknown variable in the  $n$ th equation (e.g. "Introduction" section in page 515).

Re claim 19, Simon further discloses in Figure 1 one of a plurality of update is selected in the condition is satisfied (e.g. expressions 10-22 in page 515).

Re claim 20, Simon further discloses in Figure 1 the scalar value  $d$  is added to the respective estimate value if the condition is satisfied and minimum value is the first auxiliary value (e.g. as next cycle of operation and "Preparing for the Next Cycle" section in page 516).

Re claim 21, Simon further discloses in Figure 1 the scalar value  $d$  is subtracted from the respective estimate value if the condition is satisfied and minimum value is the second auxiliary value (e.g. by the direction of error  $E$  in expression 11 in page 515).

Re claim 22, Simon further discloses in Figure 1 the first auxiliary value for the  $n$ th unknown variable is initially set to be equal to the negative of the right hand side of the  $n$ th equation (e.g. as  $b_{old}$  in expression 16 in page 515).

Re claim 23, Simon further discloses in Figure 1 the first auxiliary value for the  $n$ th unknown variable is initially set to be equal to the negative of the right hand side of the  $n$ th equation (e.g. as  $b_{old}$  in expression 16 in page 515).

Re claim 24, Simon further discloses in Figure 1 the respective first and second auxiliary values are updated if the condition is satisfied (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516).

Re claim 25, Simon further discloses in Figure 1 the first and second auxiliary values associated with each estimate value are updated if the condition is satisfied (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516).

Re claim 30, Simon further discloses in Figure 1 the scalar value  $d$  is updated such that the algorithm updates the estimate values in a bitwise manner, beginning with the most significant bit (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516).

Re claim 31, Simon further discloses in Figure 1 step (d) is carried out until a predetermined condition is satisfied (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516).

Re claim 32, Simon further discloses in Figure 1 predetermined condition is a maximum number of iterations without an update to the scalar value  $d$  (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516).



Re claim 34, Simon further discloses in Figure 1 the accurate solution of the equations is known to lie between upper and lower bounds, and the algorithm seeks a solution between upper and lower bounds (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516 by computing the norm).

Re claim 35, Simon further discloses in Figure 1 estimate values are initialised to a value which is within upper and lower bounds (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516 by computing the norm).

Re claim 36, Simon further discloses in Figure 1 estimate values are initialised to a value positioned at the midpoint of upper and lower bounds (e.g. Figure 1 and “Preparing for the Next Cycle” section in page 516 by computing the norm).

Re claim 37, it is an apparatus claim of claim 1. Thus, claim 37 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 38, it is a data carrier claim of claim 1. Thus, claim 38 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 39, it has similar limitations cited in claim 4. Thus, claim 39 is also rejected under the same rationale as cited in the rejection of rejected claim 4.

Re claim 40, it has similar limitations cited in claim 2. Thus, claim 40 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 41, it has similar limitations cited in claim 5. Thus, claim 41 is also rejected under the same rationale as cited in the rejection of rejected claim 5.

Re claim 42, it has similar limitations cited in claim 6. Thus, claim 42 is also rejected under the same rationale as cited in the rejection of rejected claim 6.

Re claim 43, it has similar limitations cited in claim 7. Thus, claim 43 is also rejected under the same rationale as cited in the rejection of rejected claim 7.

Re claim 44, it has similar limitations cited in claim 8. Thus, claim 44 is also rejected under the same rationale as cited in the rejection of rejected claim 8.

Re claim 47, it has similar limitations cited in claim 11. Thus, claim 47 is also rejected under the same rationale as cited in the rejection of rejected claim 11.

Re claim 49, it has similar limitations cited in claim 13. Thus, claim 49 is also rejected under the same rationale as cited in the rejection of rejected claim 13.

Re claim 50, it has similar limitations cited in claim 14. Thus, claim 50 is also rejected under the same rationale as cited in the rejection of rejected claim 14.

Re claim 51, it has similar limitations cited in claim 15. Thus, claim 51 is also rejected under the same rationale as cited in the rejection of rejected claim 15.

Re claim 52, it has similar limitations cited in claim 16. Thus, claim 52 is also rejected under the same rationale as cited in the rejection of rejected claim 16.

Re claim 53, it has similar limitations cited in claim 17. Thus, claim 53 is also rejected under the same rationale as cited in the rejection of rejected claim 17.

Re claim 54, it has similar limitations cited in claim 18. Thus, claim 54 is also rejected under the same rationale as cited in the rejection of rejected claim 18.

Re claim 55, it has similar limitations cited in claim 19. Thus, claim 55 is also rejected under the same rationale as cited in the rejection of rejected claim 19.

Re claim 56, it has similar limitations cited in claim 20. Thus, claim 56 is also rejected under the same rationale as cited in the rejection of rejected claim 20.

Re claim 57, it has similar limitations cited in claim 21. Thus, claim 57 is also rejected under the same rationale as cited in the rejection of rejected claim 21.

Re claim 58, it has similar limitations cited in claim 22. Thus, claim 58 is also rejected under the same rationale as cited in the rejection of rejected claim 22.

Re claim 59, it has similar limitations cited in claim 23. Thus, claim 59 is also rejected under the same rationale as cited in the rejection of rejected claim 23.

Re claim 60, it has similar limitations cited in claim 24. Thus, claim 60 is also rejected under the same rationale as cited in the rejection of rejected claim 24.

Re claim 61, it has similar limitations cited in claim 25. Thus, claim 61 is also rejected under the same rationale as cited in the rejection of rejected claim 25.

Re claim 66, it has similar limitations cited in claim 31. Thus, claim 66 is also rejected under the same rationale as cited in the rejection of rejected claim 31.

Re claim 67, it has similar limitations cited in claim 32. Thus, claim 67 is also rejected under the same rationale as cited in the rejection of rejected claim 32.

Re claim 68, it has similar limitations cited in claim 33. Thus, claim 68 is also rejected under the same rationale as cited in the rejection of rejected claim 33.

Re claim 69, it has similar limitations cited in claim 34. Thus, claim 69 is also rejected under the same rationale as cited in the rejection of rejected claim 34.

Re claim 70, it has similar limitations cited in claim 35. Thus, claim 70 is also rejected under the same rationale as cited in the rejection of rejected claim 35.

Re claim 71, it has similar limitations cited in claim 36. Thus, claim 71 is also rejected under the same rationale as cited in the rejection of rejected claim 36.

Re claim 72, it is an apparatus claim of claim 39. Thus, claim 72 is also rejected under the same rationale as cited in the rejection of rejected claim 39.

Re claim 73, it is a data carrier claim of claim 39. Thus, claim 73 is also rejected under the same rationale as cited in the rejection of rejected claim 39.

Re claim 75, it is a computer processor claim of claim 1. Thus, claim 75 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 76, it is a computer processor claim of claim 2. Thus, claim 76 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 77, it is a computer processor claim of claim 6. Thus, claim 77 is also rejected under the same rationale as cited in the rejection of rejected claim 6.

Re claim 78, it is a computer processor claim of claim 7. Thus, claim 78 is also rejected under the same rationale as cited in the rejection of rejected claim 7.

Re claim 79, it has similar limitations cited in claim 3. Thus, claim 79 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

Re claim 80, it is a computer processor claim of claim 1. Thus, claim 80 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 27-29 and 63-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simon ("An Overlaying Technique for Solving Linear Equations in Real-Time Computing").

Re claims 27-29, Simon fails to disclose in Figure 1 each estimate value is represented as a fixed point binary word; a floating point binary word; or a complex number. However, the examiner takes an Office notice that the value is represented as a fixed point binary word; a floating point binary word; or a complex number is well known in the art of the technology and widely used in many practical applications.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to have the value is presented as a fixed point binary word; a floating point binary word; or a complex number into Simon's invention because it would enable to enhance the system flexibility.

Re claim 63, it has similar limitations cited in claim 27. Thus, claim 63 is also rejected under the same rationale as cited in the rejection of rejected claim 27.

Re claim 64, it has similar limitations cited in claim 28. Thus, claim 64 is also rejected under the same rationale as cited in the rejection of rejected claim 28.

Re claim 65, it has similar limitations cited in claim 29. Thus, claim 65 is also rejected under the same rationale as cited in the rejection of rejected claim 29.

#### ***Response to Arguments***

10. Applicant's arguments filed 11/04/2008 have been fully considered but they are not persuasive.

a. The applicant argues in pages 17-18 for claims rejected under 35 U.S.C. 101 that the newly added limitations to the claims "the receipt of signals and forming a system of linear equations" would place the claims in statutory category and further the context of specification provides a number of tangible applications existing in science and engineering. In addition, the applicant requests the Examiner to provide how to overcome the rejection if it still remains as the issue.

The examiner respectfully submits that the exact wording of the claims in order to overcome the rejection under 101 should be done by applicant however the above rejection clearly addresses all the issues related to the current amended claims under patentability requirement. Further, the newly added limitations above would not automatically place the claims in statutory category since the newly added limitations merely the steps of having input data and logically forming a system of linear equations. The Examiner is unsure how these two limitations would place the claims in the statutory class. Generally, the claims do not disclose a practical application of having or forming and solving the system of linear equations as the way cited in the claimed invention. The context of specification provides a number of tangible applications but not in the claims.

b. The applicant argues in pages 18-21 for claims rejected under 35 U.S.C. 102(b) that the cited reference by Simon fails to disclose the limitations (c) and (d) wherein (c) storing an estimate value for each unknown variable in a processor; and (d) initializing in

the processor each estimate value to a predetermined value and establishing in the processor a respective auxiliary value for each estimate value.

The examiner respectfully submits that the claiming algorithm (e.g. directly from the claimed language) can be reasonably and logically seen in Figure 1 and expressions 1-2 wherein the estimate value of step c is the initial x value which can be computed using expression 2 by the initialization and external control box in Figure 1; the auxiliary value is the value from the internal adjustments value for computing the new x value in the next cycle; and the predetermined condition is the delta testing to see if the difference of current and last value is relatively small. Even though Figure 1 only discloses variables but these variables represents as a vector of element variables.

### ***Conclusion***

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHAT C. DO whose telephone number is (571)272-3721. The examiner can normally be reached on Tue-Fri 9:00AM to 7:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lewis Bullock can be reached on (571) 272-3759. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Chat C. Do/  
Primary Examiner, Art Unit 2193

January 20, 2009



**Application Number****Application/Control No.**

10/685,983

**Examiner**

Chat C. Do

**Applicant(s)/Patent under  
Reexamination**

ZAKHAROV ET AL.

**Art Unit**

2193